The Mars Global Surveyor Ka-band Link Experiment (MGS/KaBLE-II)

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Abstract

The Mars Global Surveyor (MGS) spacecraft, launched on November 7, 1996, carries an experimental space-to-ground telecommunications link at Ka-band (32 GHz) along with the primary X-band (8.4 GHz) downlink. The signals are simultaneously transmitted from a 1.5-m diameter parabolic antenna on MGS and received by a beam-waveguide R&D 34-meter antenna located in NASA's Goldstone Deep Space Network (DSN) complex near Barstow, California. This Ka-band link experiment allows the performances of the Ka-band and X-band signals to be compared under nearly identical conditions. The two signals have been regularly tracked (with a few exceptions) during the cruise phase of the mission from December 1996 to September 1997, and since then during the Mars orbital phase. Previously reported measurements have confirmed that Ka-band could increase data capacity by at least a factor of three (5 dB) compared to X-band.

This article presents updated carrier signal level (Pc/No) results for both X-band and Ka-band which include the additional data acquired during the previous year, under differing factors such as station elevation, weather, and solar elongation. In addition, the X-band (fx) , Ka-band (fKa), and difference (fx-fKa/3.8) frequency data will also be presented. These results include residual scatters and Allan deviations at different time scales as a function of solar elongation angle as MGS went behind the sun in during its solar conjunction in May 1998.